

liveries under chloroform, and in hemorrhages, either *post partum* or from placenta prævia, as employed by Chantreuil.

Liquor ammoniæ anisatus has been injected in a case of morphia-poisoning related by Levinstein; and ether injections proved serviceable in collapse following a suicidal dose of chloral-hydrate, 10 grammes (164½ grains). Finally, subcutaneous injection of ether has been employed with success in dropsy from fatty heart, where it increases, at least temporarily, the renal secretion.—*Lond. Med. Record*, May 15, 1883; from *Deutsche Medicin. Wochensch.*, Feb. 28, 1883.

Bismuth Treatment of Wounds.

The use of bismuth in antiseptic surgery has yielded good results in Germany, especially in the hands of KOCHER, of Bern, who has used it more extensively than any other surgeon. From experiments made by Schuler, Kocher's student, he concluded that the antiseptic qualities of bismuth were due to its preventing the development of micro-organisms of putrefaction, and Kocher has shown that, in the treatment of wounds, less depends upon disinfection—annihilation of micro-organisms, than upon antiseptics—preventing the development of the bacteria.

In view of the ill effects sometimes following its use, it is better not to apply the bismuth in the form of powder in unlimited quantities. One per cent. of bismuth suspended in water has fulfilled all the requirements of thorough antiseptics. Owing to the insolubility of bismuth, it should be most thoroughly triturated in water in order that no grittiness should be present, and the emulsion thus formed should be shaken until the salt is equally diffused throughout the fluid before using. Kocher applies it in the following manner: From an ordinary squirting bottle the wound surface is moistened at intervals in the course of an operation, so that the loose cellular tissues in particular are covered by a thin film of bismuth; at each dressing this procedure is repeated, but when the edges of the wound have been brought into apposition, bismuth, made into a thick paste, is spread up on the line of suture and allowed to dry into a crust. This method has been followed by the happiest results. The dressings of Kocher then consist of (1) strips of absorptive material covered by (2) a layer of gauze—both of these having been dipped in a ten per cent. solution of bismuth, and the moisture thoroughly wrung out before application—and over these is laid (3) a piece of India rubber cloth, (4) cotton wadding, and (5) a dry roller bandage finishes the dressing.

Having in view the fact that, with favourable external surroundings, the open treatment of wounds is not inferior to the antiseptic method, he adopted a plan which he calls the "secondary suture" in which he claims to have retained all the advantages of the open treatment without interfering with the success of antiseptic methods. In all cases where it did not seem advisable to rapidly complete the dressing, as after a prolonged operation or because of the exhausted condition of the patient, the sutures were not tied, but bismuth was applied in various ways. If hemorrhage was present, bismuth-gauze was introduced into the wound; when, however, hemorrhage had ceased, the bismuth dressing was applied only to the surface, the edges of the wound having been brought into contact. After twenty-four or even twelve hours, but when secondary hemorrhage had supervened, after thirty-six or forty-eight hours, the wound was finally closed by the sutures, no opening being allowed to remain. For this "secondary suture," cat-gut can be used because of its weakness, and strong silk thread should be provided, since, because of the plastic swelling of the lips of the wound, some force is required to bring them into apposition—especially when the wound has been permitted to gape. The secondary suture was employed in a number of opera-

tions of widely varying character and situation, and, as a result of this experience, Kocher asserts boldly that the formation of wound secretion after twelve to twenty-four hours is not a necessary consequence of simple traumatism.

Bismuth possesses, to an eminent degree, the property of reducing the amount of wound secretions; it has long been successfully used as an astringent in case of abnormal secretions of the intestinal canal. In its desiccating and astringent qualities are found a considerable part of its value. It is, therefore, of double value in the treatment of wounds in that (1) it secures perfect asepsis of the surface, and (2) it limits secretions in the cavity of the wound.

To obtain the advantage which bismuth offers for securing union by first intention, certain other points must receive attention. The collection of a quantity of blood in the cavity of the wound must be prevented. This may be obtained by the forepressure forceps of Pean, Billroth, or by Kocher's modification of the latter. The advantages of these forceps consist in the fact that they grasp firmly when applied, take up a limited amount of space, and are absolutely aseptic. Hemorrhage, therefore, can be promptly controlled. Since extravasation from blood and lymph vessels cannot be absolutely prevented by ligature, a uniform compression of the edges and surface of the wound throughout its whole extent is necessary.

In cases where the great irregularity of the wound cavity and the surrounding conditions did not admit of the application of sufficient pressure, the secondary suture was substituted.

In Kocher's experience with bismuth, usually within twenty-four hours, but varying from twelve to thirty-six hours, secretion from the cavity of the wound ceased. Small superficial granulations along the lines of sutures sometimes delayed healing for days; these are simply treated by the application of bismuth paste, when healing by scab will ensue.

With the rapid healing of wounds following the use of these methods, care must be taken against too early exertions upon the part of patients, subjecting them to the possible detachment of emboli, from imperfectly organized thrombi in the severed vessels. Experience shows that there is particular danger of this in wounds of the neck and other parts where the ligature of a large vein may have been necessary.

The perfect asepsis secured by bismuth is the chief point in its favour. For instance, in a case of knee-joint disease with fungous degeneration, where the joint was opened and the diseased tissue removed, then dressed with bismuth and the secondary suture, without the use of drainage-tubes, rapid and uncomplicated recovery ensued.

Another advantage of bismuth, if used according to this method, is the entire absence of direct systemic effects. The great simplicity of the method, and the absence of cumbersome details and apparatus, is of great advantage to the surgeon. The convenience and freedom from annoyance to the patient as well is greatly in its favour. The application of the salt upon a fresh wound surface causes, momentarily, a smart burning sensation. On the second day, when the secondary suture is applied, the patient no longer complains when the bismuth irrigation is used.

As an antiseptic, bismuth is of greater use than iodoform on account of its insolubility. If it is desired to disinfect hands or instruments, or if an infected wound and the integument surrounding it must be disinfected, *i. e.*, if pathogenic organisms, which have found entrance to the wound, are to be destroyed, soluble antiseptics, like carbolic acid or corrosive sublimate, should be used.—*Annals of Anatomy and Surgery*, June, 1888.